

Parasitic Helminths from Paraguay VI:  
*Cosmocerca* Diesing, 1861  
(Nematoda: Cosmocercoida) from Frogs

by

Michael R. BAKER \* and Claude VAUCHER \*\*

With 3 figures

ABSTRACT

Three species of *Cosmocerca* Diesing, 1861 (Cosmocercoida: Cosmocercidae) were recovered from frogs in Paraguay: *C. parva* Travassos, 1925, from *Hyla fuscovaria* Lutz, *Bufo paracnemis* Lutz, *Leptodactylus chaquensis* Ceï, *L. elenae* Heyer; *C. ornata* Diesing, 1861, from *Leptodactylus bufonius* Boul., *L. podicipinus* (Cope), *L. mystacinus* (Burmeister); *C. podicipinus* n. sp. from *Leptodactylus podicipinus* (Cope); *L. fuscus* (Schneider), *L. elenae* Heyer, *L. chaquensis* Ceï. This is the first report of *C. ornata* in New World frogs. It is suggested that the following species are synonymous with *C. ornata*: *Paracosmocerca mucronata* Kung & Wu, 1945, *Cosmocercella polissensis* Maguza, 1972, *Cosmocerca indica* Nama & Khichi, 1973, *Paracosmocerca spinocerca* Rao, 1979, *Cosmocerca macrogubernaculum* Rao, 1979. The three species from Paraguay are readily distinguished from each other by the shape of the plectanes, distribution and size of the male caudal papillae, and female tail shape. In *C. podicipinus* n. sp. the sclerotized underlying supports of the plectanes are fused between the plectanes on each side of the body. This is apparently unique for the genus.

INTRODUCTION

The present study continues a survey of nematode parasites from Paraguayan frogs (see BAKER & VAUCHER 1983) collected during the Museum of Geneva expedition of

\* Department of Zoology, University of Guelph, Guelph, Ontario, Canada N1G 2W1.

\*\* Muséum d'histoire naturelle, case postale 434, CH-1211 Genève 6, Suisse.

1979 (participants: F. Baud, V. Mahnert, J.-L. Perret and C. Vaucher, Geneva; C. Dlouhy, Asunción). Three species of the genus *Cosmocerca* Diesing, 1861 (Cosmocercoidae: Cosmocercinae) were collected from various hosts.

## I. DESCRIPTION OF SPECIES

### *Cosmocerca parva* Travassos, 1925

Synonym: *Cosmocerca freitasi* da Silva, 1954 (see FABIO 1981).

Material Examined: from *L. chaquensis*, MHNG 979.564 (1 ♂, 8 ♀), 979.565 (2 ♂, 13 ♀), 979.566 (1 ♂, 7 ♀), 979.597 (1 ♂, 1 ♀); from *L. elenae*, 979.572 (1 ♂, 4 ♀), 979.573 (1 ♂, 2 ♀), 979.574 (1 ♂), 979.575 (1 ♂, 6 ♀), 979.598 (1 ♂, 2 ♀); from *B. paracnemis*, 979.577 (1 ♂); from *H. fuscovaria*, 979.578 (2 ♂), 979.579 (1 ♂), 979.580 (1 ♂, 1 ♀), 979.581 (1 ♂, 1 ♀).

New host records: *L. chaquensis*, *L. elenae*. *B. paracnemis*.

Localities and dates: San Lorenzo/Asuncion, 4.10.79 (979.572); Coronel Oviedo, Caaguazu prov., 9.10.79 (979.573, 979.574, 979.598); Bella Vista, Amambay prov., 11.10.79 (979.564, 979.565); 12 Km South Bella Vista, Amambay prov., 24.10.79 (979.597); 20 Km South estancia Estrellas, Concepcion prov., 13.10.79 (979.577), 16.10.79 (979.566), 17.10.79 (979.575); estancia La Cordillera, Ypé Jhu, Canendiyu prov., 28.10.79 (979.578); Salto del Guaira, Canendiyu prov., 30.10.79 (979.579); Ao Itabo Guazu, Alto Parana prov., 5.11. 79 (979.580, 979.581).

DESCRIPTION (Fig. 1): Cosmocercinae. Oral opening triangular, three small lips present. Cephalic extremity with four large outer papillae and six minute inner labial papillae. Anterior extremity of oesophagus with three tooth-like projections covered with thick cuticle. Lateral alae extending from level of nerve ring to posterior-most pair of plectanes in male and to middle of tail in females. Somatic papillae numerous, in two subventral and two subdorsal rows extending from anterior to posterior end.

Male (13 specimens): Total length 1,68-2,46 mm. Length of oesophagus 236-405  $\mu$ m. Nerve ring 89-210  $\mu$ m and excretory pore 224-300  $\mu$ m from anterior extremity. Maximum width of lateral alae 6  $\mu$ m. Tail 129-188  $\mu$ m long, conical, with three pairs of subventral papillae (most anterior pair relatively large and usually surrounded by a single rosette of small punctations), and with one pair of subdorsal and one or two pairs of lateral papillae continuous with and similar to the subventral rows of somatic papillae. Subventral adanal region with two to four (usually three) pairs of relatively broad, flat papillae which are commonly (but not always) surrounded by a small rosette of punctations. Anterior lip of anus with one large unpaired papilla. Preanal region with five to seven pairs of plectanes, each with two complete rosettes of punctations directed perpendicular to the body surface and a relatively inconspicuous underlying sclerotized support which is not fused to other plectanes. Subventral side of body with about ten pairs of conspicuous muscles extending from anal region anteriorly to level just anterior to plectanes. Spicules 90-182  $\mu$ m long, weakly sclerotized, sharply pointed distally, with irregularly shaped, blunt proximal end. Gubernaculum 85-148  $\mu$ m long, well sclerotized.

Female (10 specimens): Total length 2,64-6,62 mm. Length of oesophagus 530-634  $\mu$ m. Nerve ring 193-207  $\mu$ m, excretory pore 318-403  $\mu$ m and vulva 1,52-3,23 mm from

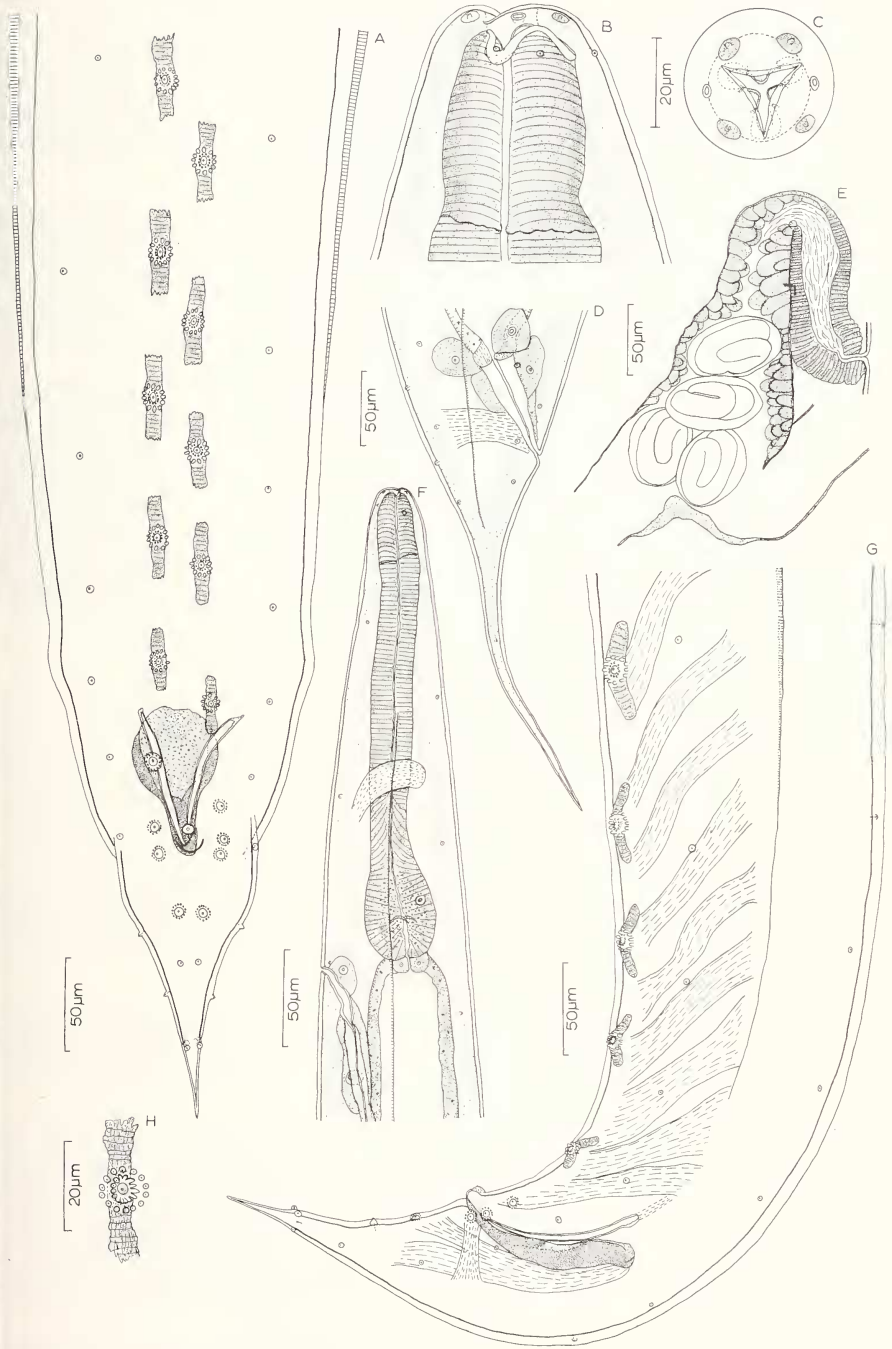


FIG. 1.

*Cosmocerca parva* Travassos, 1925. A, caudal end of male, ventral view. B, C, cephalic extremity lateral and apical view. D, tail of female, lateral view. E, vagina, lateral view. F, anterior end of male, lateral view. G, caudal end of male, lateral view. H, detail of plectane, ventral view.

anterior extremity. Maximum width of lateral alae  $8\ \mu\text{m}$ . Tail 250-394  $\mu\text{m}$  long, slender proximally and tapering gradually to spike-like posterior portion. Vagina thick-walled, directed anteriorly in first half, flexed to posterior in distal portion, giving rise to one anteriorly and one posteriorly directed uterus. Both ovaries located anterior to vulva. Uteri in mature females containing many eggs. Eggs 71-86  $\mu\text{m}$  long and 47-56  $\mu\text{m}$  wide (based on five specimens), thin-walled, specimens near vagina containing fully developed larvae.

DISCUSSION: *C. parva* was originally described from *Elosia nasus* (Leptodactylidae) of Angra dos Reis, Brazil. It has also been reported in *Leptodactylus mystaceus*, *L. caliginosus*, *L. sibilatrix*, *L. ocellatus*, *Adenomera marmorata* (Leptodactylidae), *Physalaemus signiferus* (Leptodactylidae), *P. soaresi* of Rio de Janeiro, Brazil (FABIO 1982), and *Leptodactylus* sp. of Paraguay (no precise locality) (MASI PALLARÉS & MACIEL 1974). A detailed description has not been published.

*C. parva* is easily distinguished from the other *Cosmocerca* species reported herein from Paraguay. From *C. ornata* it differs in the shape of the plectanes, the number and distribution of papillae in the male caudal end, the lack of a terminal spike on the distal end of the male tail, and in the female tail which is relatively less spike-like distally. From *C. podicipinus* n. sp. it differs in the morphology of the plectanes (underlying sclerotized supports not fused between plectanes), the subventral adanal caudal papillae in males (protruding relatively little from the body surface as opposed to protruding greatly), wider lateral alae, blunter male tail, relatively smaller and more evenly tapering female tail.

#### *Cosmocerca ornata* Diesing, 1861

Synonyms: *Cosmocerca minuscula* Travassos, 1931 (see HARTWICH 1975)  
*Paracosmocerca mucronata* Kung & Wu, 1945 (new synonym)  
*Cosmocercella polissensis* Maguza, 1972 (new synonym)  
*Cosmocerca indica* Nama & Khichi, 1973 (new synonym)  
*Paracosmocerca spinocerca* Rao, 1979 (new synonym)  
*Cosmocerca macrogubernaculum* Rao, 1979 (new synonym)

Material examined: from *L. bufonius*, MHNG 979.582 (1 ♂, 3 ♀), 979.583 (1 ♂, 5 ♀), 979.599 (1 ♂, 1 ♀), 979.600 (1 ♂, 9 ♀), 979.601 (1 ♂), 979.602 (1 ♂); from *L. podicipinus*, 979.584 (1 ♂, 10 ♀); from *L. mystacinus*, 979.594 (1 ♂, 8 ♀).

New host records: all.

Localities and dates: San Lorenzo/Asuncion, 4.10.79 (979.594); 20 Km South estancia Estrellas, Concepcion prov., 16-18.10.79 (979.582, 979.583, 979.599-602); Puerto Sta Theresa, Alto Parana prov., 4.11.79 (979.584).

DESCRIPTION (Fig. 2): Cosmocercinae. Oral opening triangular, three small lips present. Cephalic extremity with four large outer papillae and six minute inner labial papillae. Anterior extremity of oesophagus with three tooth-like projections covered with thick ring of cuticle. Lateral alae extending from mid-point between mouth and nerve ring to point near most posterior plectanes in male and to proximal thick part of tail in female. Somatic papillae in two subventral and two subdorsal rows extending from anterior to posterior end; numerous at cephalic extremity.

Male (4 specimens): Total length 1.33-1.79 mm. Length of oesophagus 315-380  $\mu\text{m}$ . Nerve ring 96-239  $\mu\text{m}$  and excretory pore 130-292  $\mu\text{m}$  from anterior extremity. Maximum

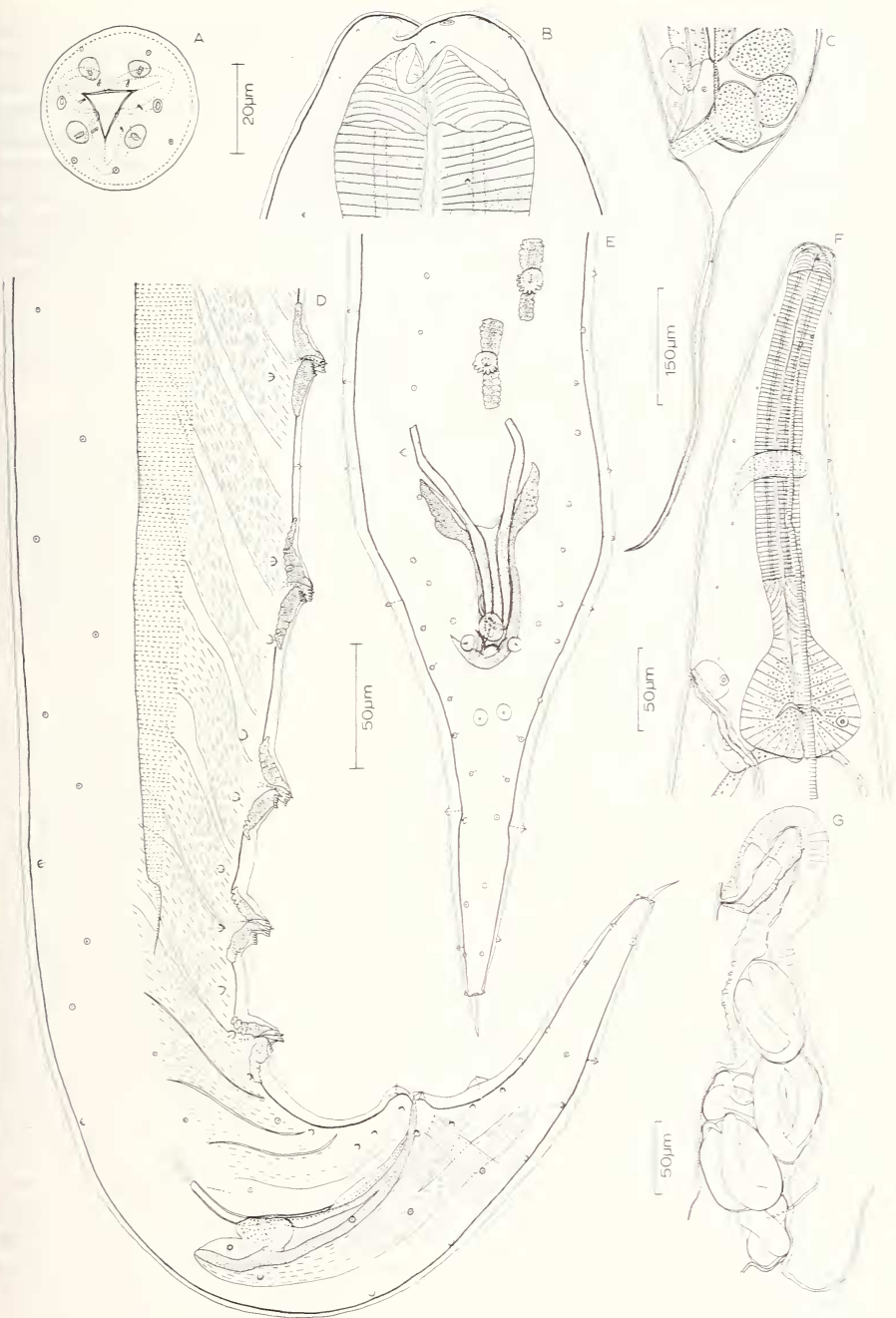


FIG. 2.

*Cosmocerca ornata* Diesing, 1861. A, B, cephalic extremity, apical and lateral view. C, tail of female, lateral view. D, E, caudal end of male, lateral and ventral view. F, anterior end of male, lateral view. G, vagina, lateral view.



width of lateral alae 22  $\mu\text{m}$ . Tail 146-154  $\mu\text{m}$  long, conical, with terminal spike 13-18  $\mu\text{m}$  long. Tail and caudal region up to level of lateral alae with numerous small papillae indistinguishable from somatic papillae and distributed in subventral, lateral and subdorsal rows. Proximal third of tail with one pair of subventral papillae markedly larger than somatic papillae; adanal region with similarly enlarged pair of papillae beside anus and one large unpaired papilla on anterior lip of anus. Preanal region with plectanes; five pairs present in three specimens, three pairs and one unpaired plectanes present in one specimen. Plectanes directed slightly posteriorly, papilla bordered on posterior side with two semicircular rows of rosette-like punctations, underlying sclerotized supports conspicuous and not fused between plectanes. Subventral side of body with about 11 pairs of conspicuous muscles extending from anal region anteriorly to level just anterior to plectanes. Spicules 83-108  $\mu\text{m}$  long, weakly sclerotized, sharply pointed distally, with blunt, smooth proximal end. Gubernaculum 106-122  $\mu\text{m}$  long, well sclerotized.

Female (10 specimens): Total length 2,55-4,01 mm. Length of oesophagus 485-584  $\mu\text{m}$ . Nerve ring 165-207  $\mu\text{m}$ , excretory pore 345-430  $\mu\text{m}$  and vulva 1,27-1,88 mm from anterior extremity. Maximum width of lateral alae 18  $\mu\text{m}$ . Tail 449-608  $\mu\text{m}$  long, tapering abruptly in proximal eighth to a long spike-like posterior portion, phasmids conspicuous. Vagina thick walled in proximal half, directed anteriorly in first quarter, flexed to posterior in distal portion, giving rise to one anteriorly and one posteriorly directed uterus. Both ovaries located anterior to vulva. Uteri in mature females packed with many eggs. Eggs 102-119  $\mu\text{m}$  long and 61-81  $\mu\text{m}$  wide (based on five specimens), thin-walled, specimens near vagina containing fully developed larvae.

DISCUSSION: *C. ornata* was originally described from amphibians of Western Europe and the present study is the first report of it in the New World. *C. ornata* has a suite of unique morphological characters which readily permits its identification (posteriorly directed plectanes surrounded by two semicircles of punctations, short spike-like point on the male tail, distribution of male caudal papillae, relatively wide lateral alae in males, female tail which is spike-like throughout most of its length). However, despite this distinctive morphology, the lack of an adequate published description (see HARTWICH 1975) has prevented an understanding of its markedly wide geographical distribution. After examining museum specimens from widely separate localities and reviewing the literature we have determined that *C. ornata* occurs in the Old World in a variety of frogs (Ranidae, Bufonidae, Discoglossidae, Microhylidae, Pipidae) from Western Europe and Spain (HARTWICH 1975; LÓPEZ-NEYRA 1947), Russia (MAGUZA 1972), Sierra Leone (PUYLAERT 1970), South Africa (BAKER 1981), mainland Malaysia (BAKER 1982), China (KUNG & WU 1945), and India (RAO 1979, NAMA & KHICHI 1973). Several *Cosmocerca* species once believed to be distinct are revealed herein as being synonymous with *C. ornata*. The following new records are added (from the collections of the Laboratoire des Vers, Museum National d'Histoire Naturelle, Paris): mainland Malaysia (Kuala Lumpur), *Kaloula pulchra* (Microhylidae) (no. 42JE), *Rana limnocharis* (Ranidae) (91JE), *R. nitida* (22KL), *R. erythraea* (40KL), *Rhacophorus leucomystax* (Ranidae) (10KL); Upper Volta, *Bufo* sp. (119JA), *Xenopus fraseri* (Pipidae) (8HB). All except *R. limnocharis* are new host records. No morphological differences were observed between specimens we have examined from Old World hosts and specimens described herein from Paraguay.

The occurrence of *C. ornata* in several zoogeographical regions of the Old World is not unusual for the Cosmocercinae (see BAKER 1982) and in fact its distribution closely parallels that of *Aplectana macintoshii* (Stewart, 1914) (Cosmocercinae) (BAKER

1980). Such wide distributions may be either ancient (related to continental drift) or relatively recent (by dispersal of host groups over contiguous land masses). However, the finding of *C. ornata* in South American frogs indicates a distribution related to continental drift. *Cosmocerca* species have not been reported from Central or North America, indicating that dispersal between the Old and New Worlds by the Bering Land Bridge is unlikely for this parasite genus. Only one other species of Cosmocercinae in frogs (*Aplectana hylambatis* (Baylis, 1927)) has a comparable Old World (Guinea) and New World (Argentina) distribution (BAKER 1980).

*Cosmocerca podicipinus* n. sp.

Type Material; MHNG 979.595 (1 ♂, 7 ♀).

Host of Type: *Leptodactylus podicipinus*.

Locality and date: Capitan Bado, Amambay prov., 27.10.79.

Other Material: from *L. podicipinus*, MHNG 979.585 (1 ♂, 1 ♀), 979.586 (1 ♂, 7 ♀), 979.587 (1 ♂, 2 ♀), 979.588 (1 ♂, 5 ♀), 979.589 (1 ♂, 1 ♀), 979.590 (1 ♂, 1 ♀), 979.591 (1 ♂, 5 ♀), 979.592 (1 ♂), 979.593 (1 ♂, 7 ♀), from *L. fuscus*, 979.570 (1 ♂, 6 ♀), 979.571 (1 ♂, 5 ♀); from *L. elenae* 979.576 (2 ♂, 8 ♀); from *L. chaquensis*, 979.567 (1 ♂, 4 ♀), 979.568 (1 ♂), 979.569 (6 ♂, 47 ♀), 979.603 (1 ♂).

Localities and dates: Coronel Oviedo, Caaguazu prov., 9.10.79 (979.570); Bella Vista, Amambay prov., 13.10.79 (979.567, 979.585, 979.586); Colonia Sgto Jose E. Lopez, Concepcion prov., 13.10.79 (979.571, 979.576); estancia Estrellas, Concepcion prov., 15.10.79 (979.568); Puerto Max, Concepcion prov., 17.10.79 (979.569); Ao Tagatyami, Concepcion prov., 21.10.79 (979.587, 979.588, 979.589); est. Garay Cué, Concepcion prov., 22.10.79 (979.603); Capitan Bado, Amambay prov., 27.10.79 (979.590); estancia La Cordillera, Ypé Jhu, Canendiyu prov., 28.10.79 (979.591); Puerto Sta Theresa, Alto Parana prov., 4.11.79 (979.592); Ao Itabo Guazu, Alto Parana prov., 4.11.79 (979.593).

**DESCRIPTION** (Fig. 3): Cosmocercinae. Oral opening triangular, three small lips present. Cephalic extremity with four large cephalic papillae and six minute labial papillae visible only in apical view. Anterior extremity of oesophagus with three tooth-like projections covered with thick ring of cuticle. Lateral alae more prominent in male than in female; in male alae extending from just posterior to oesophagus to just anterior to most anterior pair of plectanes, in female extending from position about 500  $\mu$ m posterior to oesophagus to position about 500  $\mu$ m anterior to the anus. Somatic papillae numerous, in two subventral and two subdorsal rows extending from anterior to posterior end.

Male (holotype): Total length 2,97 mm. Length of oesophagus 348  $\mu$ m. Nerve ring 217  $\mu$ m and excretory pore 295  $\mu$ m from anterior extremity. Maximum width of lateral alae 12  $\mu$ m. Tail 181  $\mu$ m long, tapering rapidly in proximal sixth to slender terminal portion. Tail with five pairs of subventral, one pair of lateral and six pairs of subdorsal papillae indistinguishable from somatic papillae; subdorsal and subventral papillae continuous with rows of somatic papillae. Adanal region with three pairs of large subventral rosette papillae protruding well above body surface and large unpaired papilla on anterior lip of anus. Preanal region with five pairs of plectanes, each with two complete rosettes of punctations directed perpendicular to the body surface.

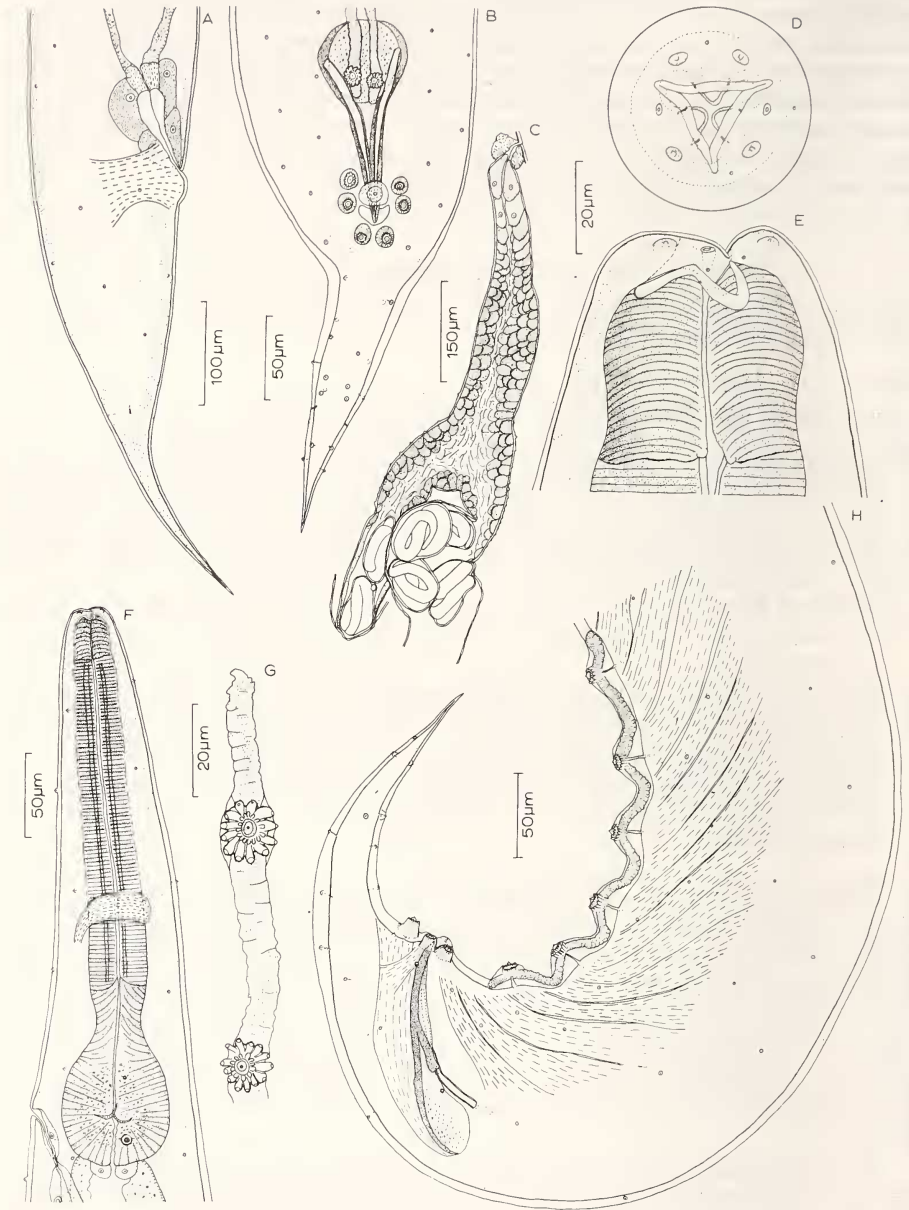


FIG. 3.

*Cosmocerca podicipinus* n. sp. A, tail of female, lateral view. B, caudal end of male, ventral view. C, vagina, lateral view. D, E, cephalic extremity, apical and lateral view. F, anterior end of male, lateral view. G, detail of anterior-most plectanes, ventral view. H, caudal end of male, lateral view.



Underlying sclerotized supports of plectanes conspicuous and fused between plectanes on each side of body. Subventral side of body with 14 pairs of conspicuous muscles extending from anal region anteriorly to level just anterior to plectanes. Spicules 94  $\mu\text{m}$  long, weakly sclerotized, sharply pointed distally, with blunt, smooth proximal end. Gubernaculum 134  $\mu\text{m}$  long, well sclerotized.

Female (allotype): Total length 5,81 mm. Length of oesophagus 551  $\mu\text{m}$ . Nerve ring 232  $\mu\text{m}$ , excretory pore 383  $\mu\text{m}$  and vulva 2,83 mm from anterior extremity. Maximum width of lateral alae 2  $\mu\text{m}$ . Tail 511  $\mu\text{m}$  long, relatively thick in anterior third, tapering rapidly to spike-like terminal third. Vagina directed posteriorly throughout its length, thick-walled in proximal three-quarters, divided into two branches in posterior quarter, one uterus anteriorly directed and the other posteriorly directed. Both ovaries located anterior to vulva. Uteri in mature females containing many eggs. Eggs 89-97  $\mu\text{m}$  long and 56-66  $\mu\text{m}$  wide (based on five specimens), thin-walled, specimens near vagina containing fully developed larvae, free larvae not observed *in utero*.

Other Specimens: Measurements of 10 males and 10 females are as follows:

Males — total length 1.88-3.17 mm; oesophagus 308-371  $\mu\text{m}$  long; nerve ring 168-250  $\mu\text{m}$ , excretory pore 258-376  $\mu\text{m}$  from anterior extremity; spicules 82-188  $\mu\text{m}$ , gubernaculum 87-152  $\mu\text{m}$ , tail 163-212  $\mu\text{m}$  long.

Females — total length 2,86-7,33 mm; oesophagus 462-639  $\mu\text{m}$  long; nerve ring 176-247  $\mu\text{m}$ , excretory pore 305-470  $\mu\text{m}$  and vulva 1,49-3,70 mm from anterior extremity; tail 281-605  $\mu\text{m}$  long.

Males were similar to the holotype except for slight variations in the number of small papillae on the tail. Also one specimen had only five adanal rosette papillae (one of which contained two sensory endings), and this same specimen had six plectanes on one side of the body and five on the other. The underlying sclerotized supports for the plectanes in small males were relatively undeveloped and did not display the characteristic fusion between plectanes observed in fully mature males.

DISCUSSION: *C. podicipinus* n. sp. is readily distinguished from other species by the fusion of the underlying sclerotized plectane supports between the plectanes on each side of the body. Other distinctive characters include the three pairs of markedly elevated adanal rosette papillae in males and the markedly thickened proximal half of the female tail.

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